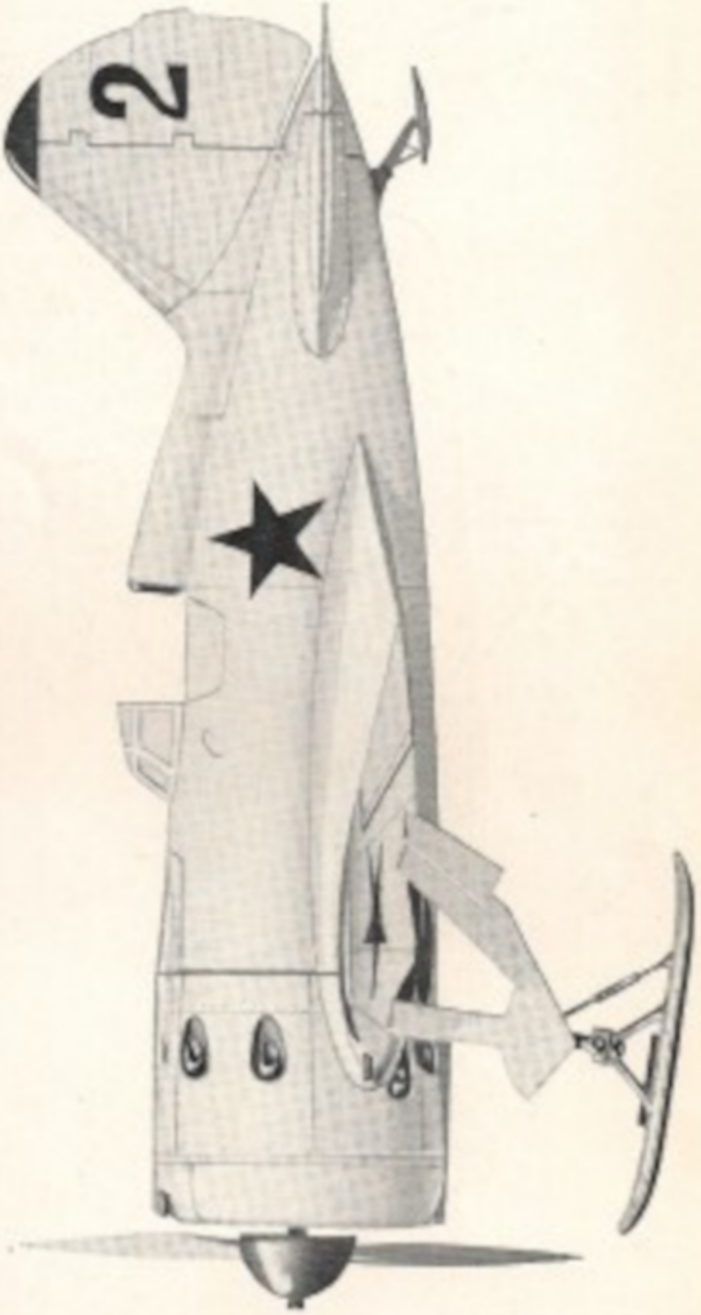
PROFILE PUBLICATIONS

The Polikarpov I-16



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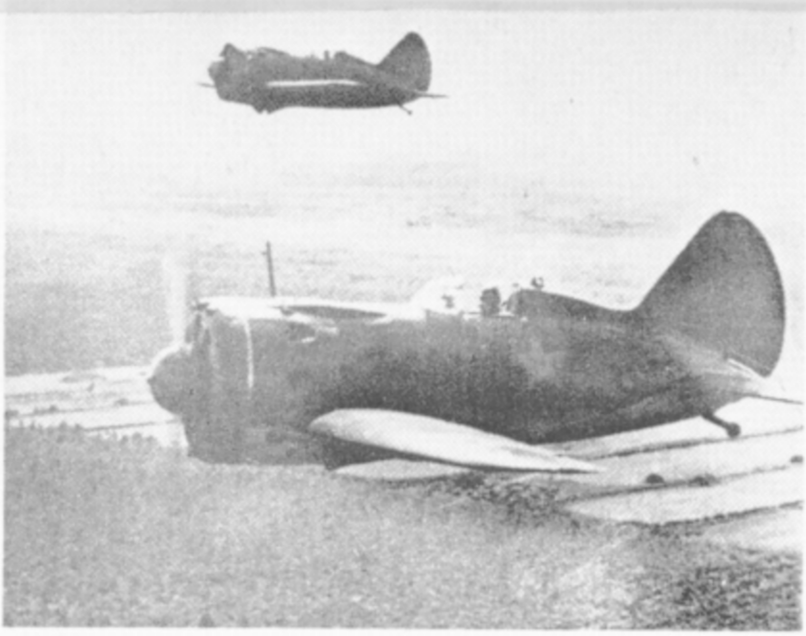


A pair of late-model I-16's patrol over the vast forests of Russia. After widespread service in the first year of Soviet involvement in the Second World War, the Ishak *was progressively relegated to various second-line combat duties such as static area defence.*
(Photo: Imp. War Mus. RUS 345)

The Polikarpov I-16

by Witold Liss

In the early 1930's, most fighter aircraft were designed according to a well-established principle. Strutted biplanes with open cockpits, fixed undercarriages and relatively powerful engines best answered the requirements of the world's air forces; among the most pressing of these requirements were manoeuvrability and a low, safe landing speed. Construction differed little from nation to nation, the majority of these types being of wooden or light metal tubular structure with plywood or fabric skinning; and only a few examples of the next logical step, the strutted monoplane, appeared during this period, such as the Boeing P-26, the Dewoitine D.500, and the P.Z.L. P-11.

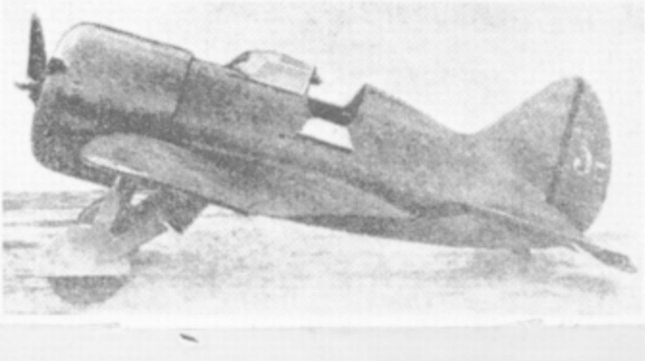
At this time, very little was known in Europe and America about the state of aviation in the U.S.S.R. The general opinion was that the equipment of the Red Air Force was lagging far behind current Western designs; that a weak aviation industry, an obsolete grasp of the principles of warfare, and the poverty of every field of Soviet life had prevented Russian air power from reaching a realistic level. For good measure, it was also rumoured that Russian designers were incapable of producing an original conception, and relied on copies and modifications of Western designs. (The same myth was spread about Japan in the years before Pearl Harbour; and the world found out its error in a harsh awakening). There was a grain of truth in this negative view; the years which followed the Revolution had been extremely disruptive for society in general and industry in particular, and the Soviet aviation teams suffered from lack of contact with their foreign contemporaries; but simple ignorance of Russian progress was the largest reason for this attitude abroad.

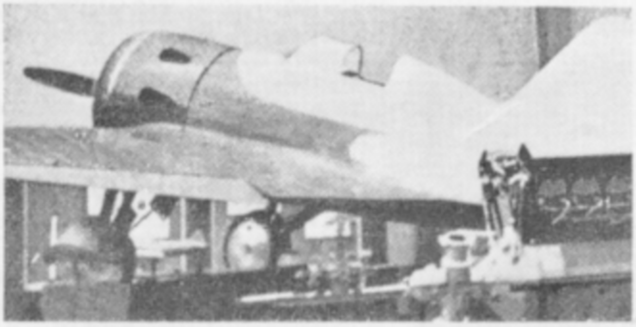
The VVS-RKKA (Red Air Force, or in full *Voyenno-Vozdushnye Sily Rabocho-Krestyanskoy Krasnoy Armii*, "Air Forces of the Workers' and Peasants' Red Army") was rumoured to be an unwieldy organisation with obsolete equipment, poor armament, and weak administrative structure, the only advantage being sheer weight of man-power. The only reasonably up-to-date aircraft known to be in service were the I-15 fighter biplane and the TB-3 heavy bomber. Hence, when a new, barrel-shaped fighter monoplane appeared over Red Square during the 1935 May Day parade, the event passed almost unnoticed. However, when German He 51's and Italian CR.32's encountered a fast, manoeuvrable monoplane with retractable undercarriage over Spain some eighteen months later, certain foreign observers were forced to revise their opinions in a hurry. One school of thought held that the new type was simply a copy of some design such as the P-26; others hailed it as a revolutionary new concept, the only modern fighter in the world. The truth, as usual, was somewhere between the extremes of scorn and reverence. The I-16 was neither a copy of the P-26 nor a miracle of far-sighted design. It was however a most modern design for its time, and the first of a class of aircraft which were to be accepted, in the years that followed, by every nation in the civilised world. It represented a true break-through in design thinking; and like many trail-blazers it was troublesome and sometimes dangerous in flight, and certainly not invincible. It was called by many names during its career; *Yastrebok*, "Young Eagle", in the land of its origin: *Mosca*, "Fly", by the men who flew it in Spain, and *Rata*, "Rat", by those who faced it: *Abu*, "Gadfly", by the Japanese: *Dienstjäger*, "Duty Fighter", by the Germans. But in the end it was simply *Ishak*, "Little Donkey", patiently taking on the dirty, unwanted, but necessary jobs which fell to its lot along the weary road to final victory for its homeland.

DESIGN HISTORY AND DEVELOPMENT

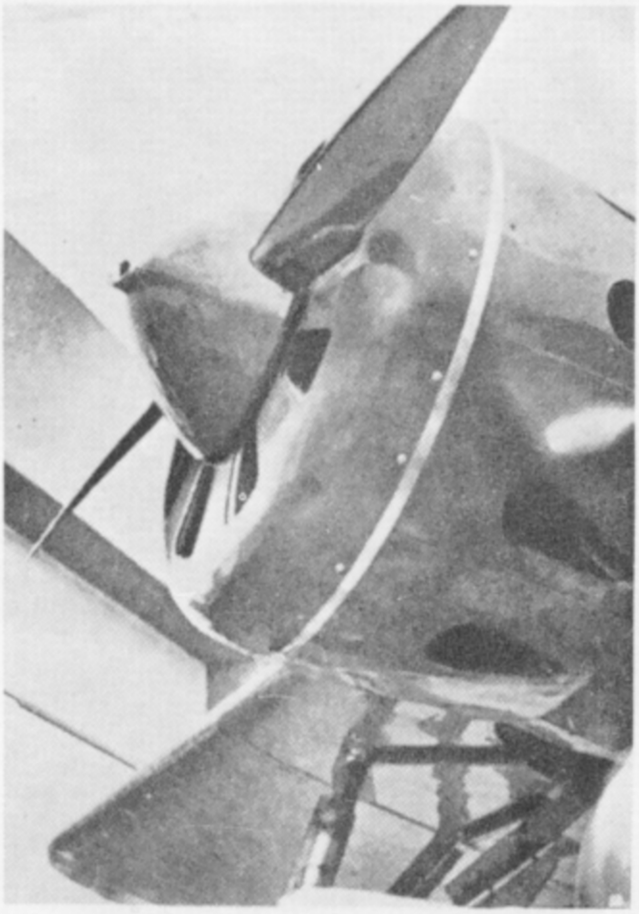
Early in 1932, two construction bureaux in the U.S.S.R. began parallel work on a new fighter for the V.-V.S. The requirement was stated in simple terms; the machine must be designed with a con-

Powered by a 480 h.p. M 22 engine, the I-16 Type 1 entered squadron service with the V.-V.S. in 1934. Note the single-piece canopy and windshield slide forward for cockpit access.
(Photo: Passingham/Klepacki Collection)





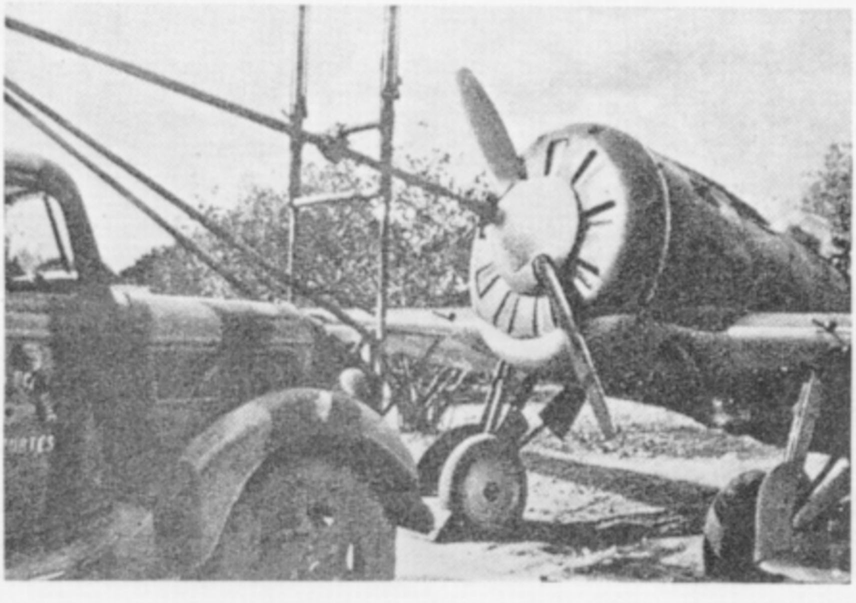
The Type 6, displayed at the Milan Exhibition of 1935. This variant featured 9 mm. cockpit armour, a sophisticated refinement for its day. It was powered by the M 25A of 730 h.p.
(Photo: Passingham/Klepacki Collection)



struction suitable for the industrial conditions actually obtaining at the time, and must have better performance than any other fighter in the world! The first proviso excluded the second, if the classic principles were to be followed. Construction had to be simple, for production by an unskilled work force; unsophisticated, easy to maintain, and rugged in service. Seen in the light of the availability of high quality materials in the U.S.S.R. at that time, the situation seemed unpromising. Necessity proved the mother of invention, however; both designs eventually displayed advanced characteristics, to be found nowhere else in the world at that stage.

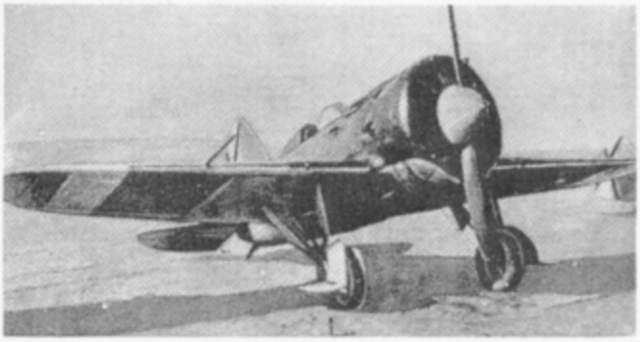
The first competitor, the I-14, was designed by Pavel Sukhoi and built by C.A.G.I. (Central Institute for Aero- and Hydrodynamics); it was powered by a Bristol Mercury V S-2 radial engine of 570 h.p. It was a low-wing cantilever monoplane of wooden structure, with an enclosed cockpit, and an armament of two 20 mm. cannons and two 7·62 mm. machine guns. Despite the great advance it seemed to represent, the I-14 proved during its test flight programme to be capable of very little performance advantage over the more manoeuvrable I-15 biplane which was being produced currently. The conclusion was obvious, and the more "classic" I-15 was placed in service, the I-14 remaining a museum piece for posterity.

The second design, designated at that stage CKB 12, was produced by the *Centralnoye Konstruktorskoye Byuro* (Central Design Bureau) team under the leadership of Nikolai Polikarpov, creator of the I-15. The CKB 12, or I-16, was a low-wing cantilever monoplane of mixed wood and metal construction, with an enclosed cockpit and retractable undercarriage and had several features in common with its biplane stablemate. First flown on 31st December, 1933, it achieved a top speed of 224 m.p.h., was more manoeuvrable than the I-14, and offered armour protection for the pilot, which was considered an unnecessary luxury in those days. Perhaps the deciding factor in its acceptance was its obvious development potential. It was introduced to mass production almost immediately, at the largest Soviet aircraft plants at Moscow and Gorki. The initial production I-16 Type 1 had a more powerful engine, rated at 480 h.p., and two new Shkas 7·62 mm. machine guns of much higher rate of fire than the previously-standard PV-1 weapons. First deliveries of the type to service units took place in the autumn of 1934, and the first large-scale appearance before the public was during the May Day parade and fly-past over Red Square in 1935. Both this event, and the machine's participation in the large-scale war games in the Southern and Central Military Districts round Kiev in the autumn of 1935, passed almost unnoticed by foreign observers; perhaps the superficial resemblance to the biplane I-15 was responsible. For a time, at any rate, only Russian pilots were concerned with evaluating their new toy; and it proved to be a troublesome newcomer. Its very small dimensions made the I-16 as unstable as it was manoeuvrable; the high weight/surface ratio caused take-off and landing speeds to be almost unacceptably



A Type 10 of the Spanish Republican Air Force with a Hucks-type starter truck.
(Photo: Passingham/Klepacki Collection)

One of the Type 10 Abu's *used in the Sino-Japanese War, displayed after capture by the I.J.A.A.F.* (Photo: Passingham/Klepacki Collection)



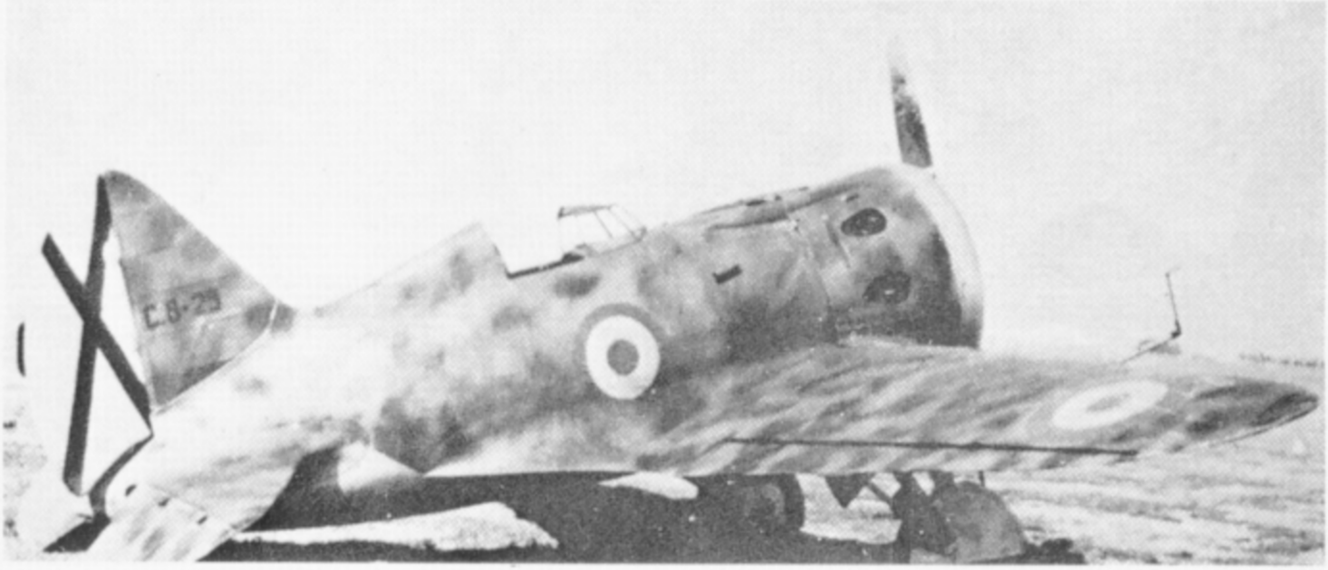
This Type 10 has apparently been captured by Spanish Nationalist forces; the Nationalist cross has been applied to the rudder but it retains the Government wing band. (Photo: Heinz Nowarra)

high by the standards of the day, and the enclosed cockpit and retractable undercarriage proved distinctly unpopular. The latter was a major hazard for novice pilots; it required 25 turns of a hand-crank at a critical phase of the flight.

The I-16 Type 1 was already in service when the second round of its competition with the I-14 took place. On 12th February 1934 the I-14bis had been test flown; and six days later the famous test-pilot V. Chkalov took off in the improved I-16bis, powered by the Russian M 25 engine of 700 h.p., and with an improved silhouette. The I-16bis (or CKB 12bis) reached the remarkable speed of 450 km/h (279·1 m.p.h.). The renewed tests revealed such unpleasant flight characteristics in the I-14 that the I-16 was finally given the "green light" for quantity production. A small batch of I-16bis were already in service when, in June 1934, the next true variant appeared. This was the Type 4, with the M 25 engine and similar armament to its predecessor; the Type 5 quickly followed, with minor structural changes and new 9 mm. armour for the pilot; and finally the Type 6 appeared, the first major production version and the first sub-type to fire its guns in anger.

The Type 6 had an M 25A engine of 730 h.p., and was somewhat heavier, with a slight reduction in climbing speed. It was the last variant to be built with an enclosed cockpit. The next development to be built in quantity, and introduced to service both at home and in Spain, was the Type 10, with an open cockpit, new M 25B engine rated at 750 h.p., and four Shkas 7·62 mm. machine guns. Introduced in 1937, the I-16 Type 10 had one feature which assures it of a significant place in the history of air fighting; underwing rails for six RS 82 rockets, designed by G. Langyemak and I. Kleymyenov and built at the Gas Dynamics Laboratory in Moscow. These rockets, pioneers in their field, were first tested in July 1937 by G. Bakchivangi, flying an I-16 Type 10. The rocket installation was tested under winter conditions later that year, and was introduced to service units in December after some minor teething troubles had been overcome. The Type 10 was used operationally both in Spain and over Nomon-Khan, and in the early stages of the Second World War. The trainer version, UTI-4 or I-16 UTI, was produced in parallel with the Type 10 fighter. The first trainers were converted from Type 4 fighters during final

The last airworthy example of the Rata *was probably this modified Type 10 captured in Spain and used at the Spanish Air Force's Fighter School at Moron until mid-1952.* (Photo: Heinz Nowarra)



assembly, and later they were produced complete on the production line. The need for such a trainer arose from the pilots' unfamiliarity with this radical aircraft; and the simple solution was a standard machine with a second cockpit placed in front of the fuselage fuel tank. Early production machines had the undercarriage locked down, and the cover plates removed; later versions had the conventional retractable gear.

After the service delivery of the Type 10, the design bureau turned their attention to several measures calculated to improve armament and performance. Various combinations were tested in flight and on service trials in the field. The I-16P (for *Pushka*, cannon) was armed with two 20 mm. ShVak weapons, designed by Shpitalny and Vladimirov: the Type 17 had two ShVak cannons and two Shkas machine guns: one Type 18 mounted no less than six PV-1 7·62 mm. weapons and had a bomb capacity of 100 kg. (220·4 lbs.), and one machine tested two 12·7 mm. B.S. heavy machine guns. Some of these variants saw widespread service. The Type 17, with standard two gun, two cannon armament followed the Type 10 into service, and the Type 18 introduced the M 62 engine of 1,000 h.p. The most numerous of the later sub-types was the Type 24 fitted with either the M 62 or M 63 engine.

The next pure fighter design development was the I-180, powered by the M 88 engine, with enclosed cockpit and improved silhouette. This was test flown by V. Chkalov but following his death during flight trials it was never introduced to production. It is perhaps noteworthy that an in-line engined variant was evolved from the I-16, the CKB 19, which was designed for a Hispano Suiza engine. In its turn, this design was evolved into the CKB 33, fitted with an M 100 engine, which achieved a speed of 500 km/h in May 1935. The final development of this concept was the I-17 fighter, which was built in small numbers and is said to have seen combat over Moldava in the opening stages of Russia's involvement in the Second World War in 1941.

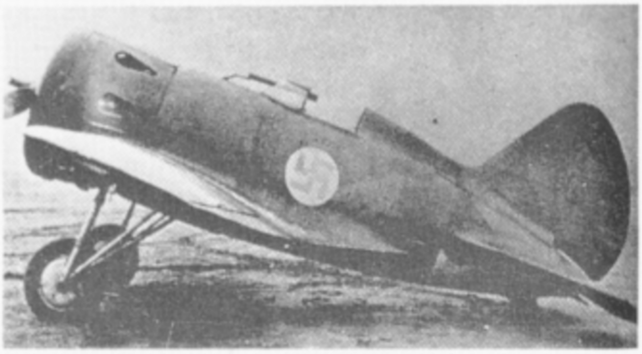
PICK-A-BACK FIGHTERS

One of the most spectacular development projects involving the I-16 was the *Zveno* programme. (A literal translation of this word is "cluster", hence its use in the project described below. However, used in the sense of a small group, *zveno* was used as an air force unit designation roughly corresponding to the Western "Flight" or the German *Staffel*).

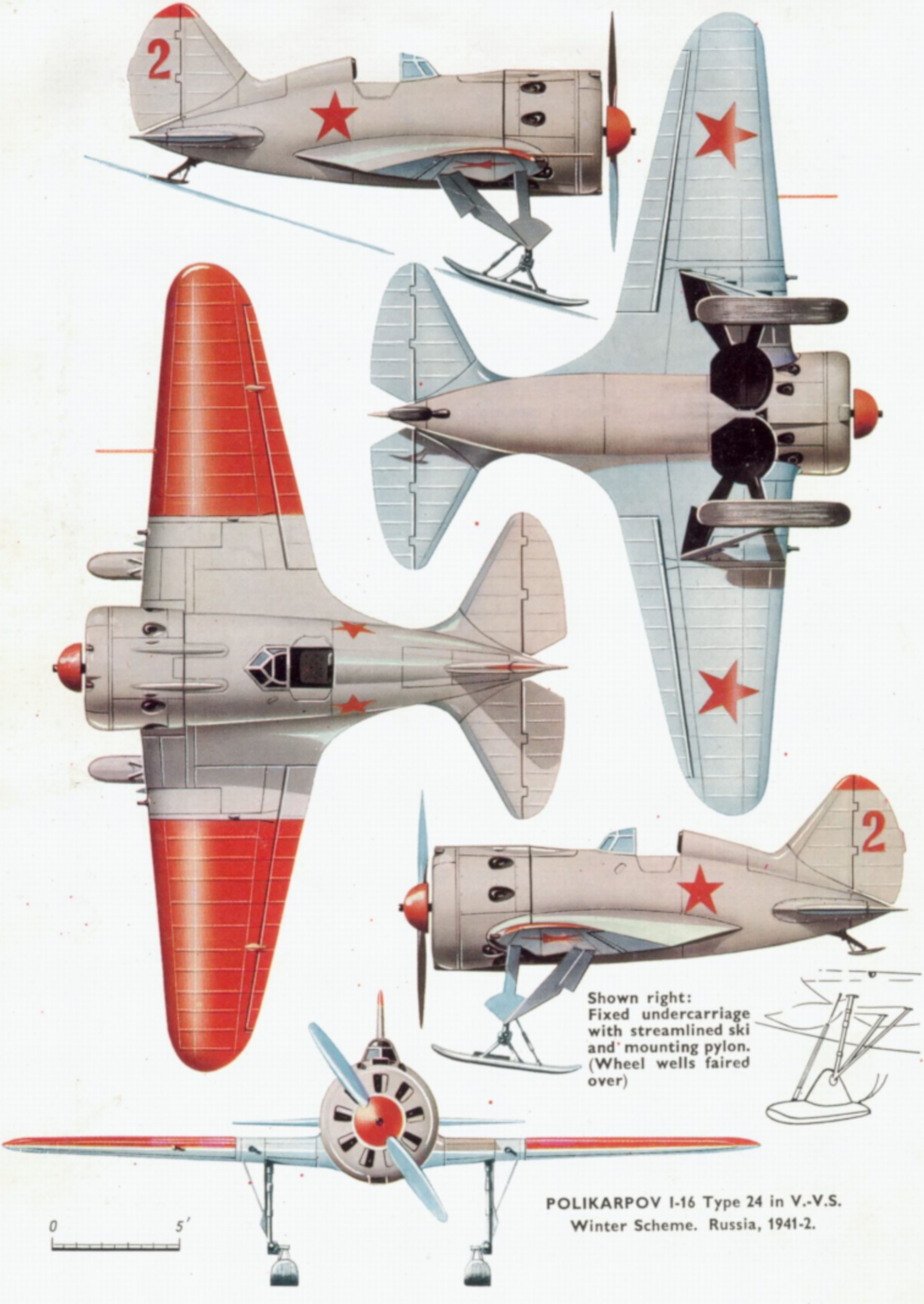
The basic idea was to afford a TB-3 heavy bomber with its own fighter protection for long-range lone missions. Each TB-3 was to carry two I-15 biplanes standing on the wings and two I-16's hanging beneath the wings. A third I-16 was to hang under the centre-section, between the undercarriage legs. All the "lower" components of this group had to join the mother-ship in the air. This concept, introduced by Ing. Vakhmistrov in 1932, was given practical tests by a group of very experienced pilots; Suprun, Stefanovski, Chkalov, Nikazin, Suzin, Stiepanchonok, Altynov and Budakov. Stefanovski piloted the bomber, and the four wing fighters were flown by Suprun, Nikazin, Altynov and Budakov. The lower centre aircraft was flown by Stiepanchonok, who put himself through a hair-raising programme of close flying, culminating in successful attempts to cut tapes between the undercarriage legs of the TB-3 without touching the bomber itself. Russian reports state that after some months of test flying, the combination had been successfully put through all stages of the regime; but the idea was dropped, as too sophisticated for service use. A modified *Zveno II* programme was introduced, consisting of a TB-3 with two specially modified I-16 dive-bomber aircraft slung under the wings. This sub-type of the *Ishak* was known as the

A line-up of ski-equipped Type 10's in Finland.
(Photo: Passingham/Klepacki Collection)

Together with the I-15 biplane, the I-16 saw considerable service on the Finnish front during the Winter War. This ski-equipped machine captured by the Finns bears the serial VH 201; it was one of a number of captured Russian aircraft used by the Finnish Air Force for second-line work, but it is doubtful if it ever saw actual combat in its new livery.
(Photo: G. H. Kamphuis)



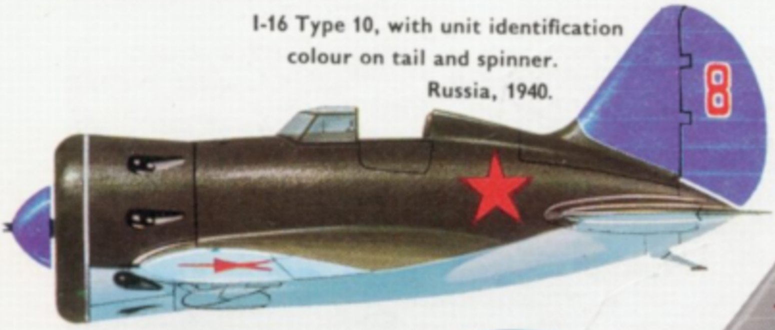
Above and below: *IR-101, another machine captured by the Finns, displays the fixed, braced undercarriage sometimes used by training and liaison I-16's. This aircraft appears to be finished in the "Continuation War" scheme of forest green/black-green shadow shading and deep yellow fuselage band.*



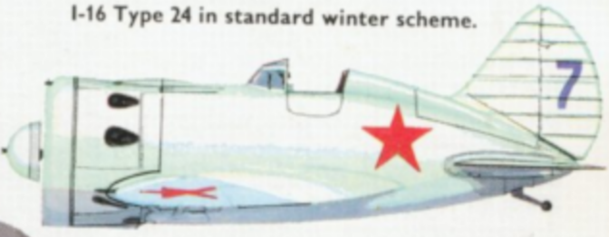
Shown right: Fixed undercarriage with streamlined ski and mounting pylon. (Wheel wells faired over)

POLIKARPOV I-16 Type 24 in V.-V.S. Winter Scheme. Russia, 1941-2.

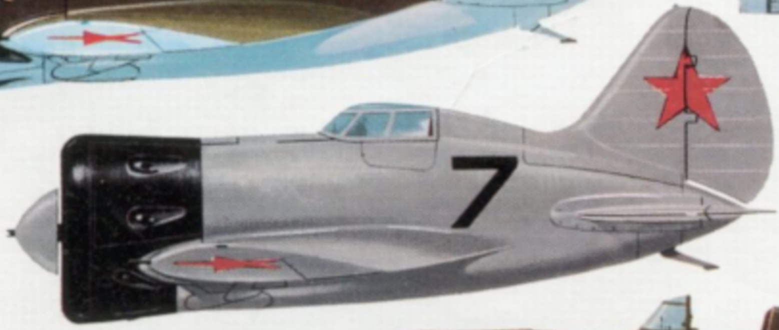
I-16 Type 10, with unit identification colour on tail and spinner. Russia, 1940.



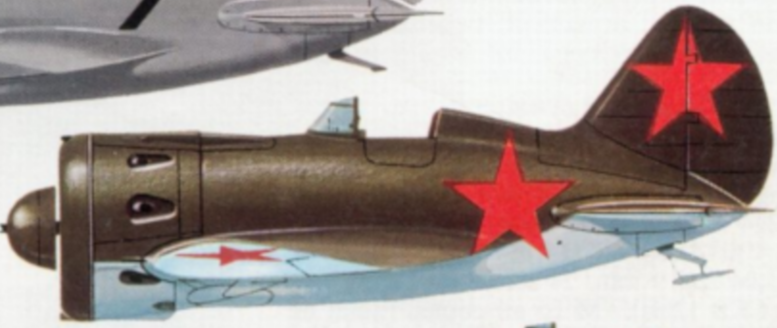
I-16 Type 24 in standard winter scheme.



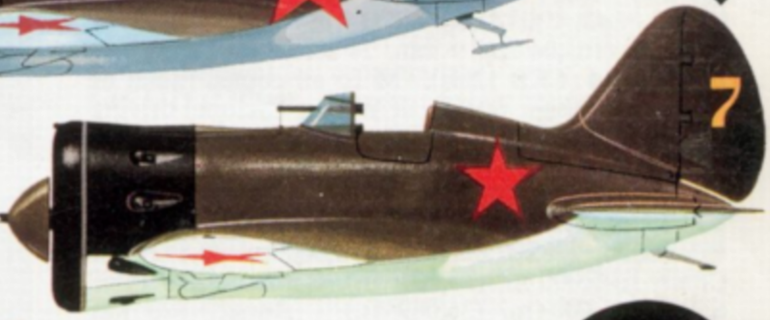
I-16 Type 10 of 22nd Fighter Regt.; Nomon Khan, Russian Mongolia, August 1939. Overall grey scheme.



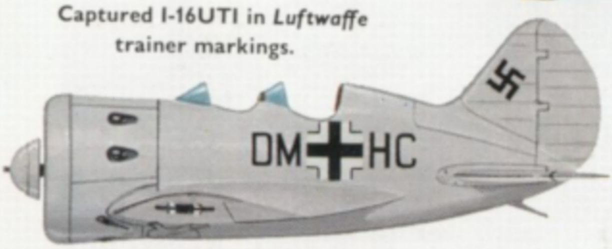
I-16 Type 24 in standard medium green temperate climate scheme. ▶



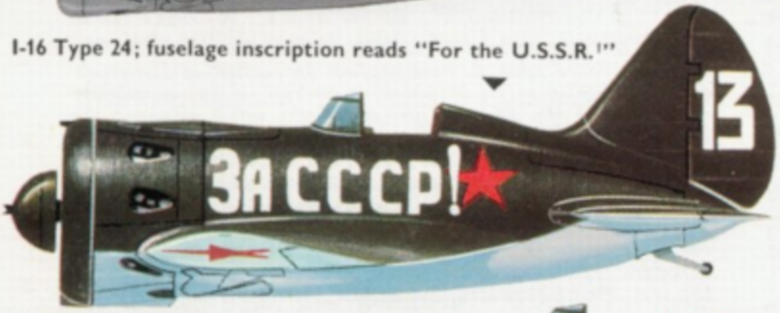
I-16 Type 10, Bialystok, Eastern Poland, 1939-40. Note white undersurfaces. ▼



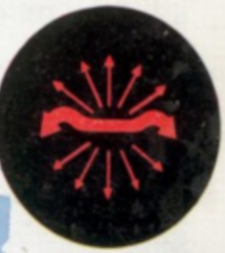
Captured I-16UTI in *Luftwaffe* trainer markings.



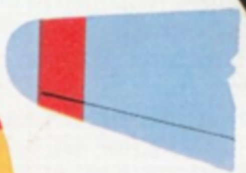
I-16 Type 24; fuselage inscription reads "For the U.S.S.R.!" ▼

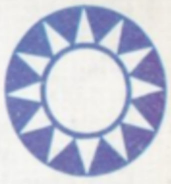


A Spanish Nationalist Air Force emblem.



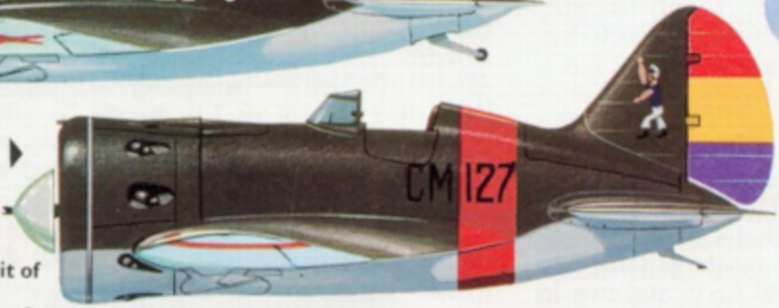
Upper/under wing, Republican A.F. ◢



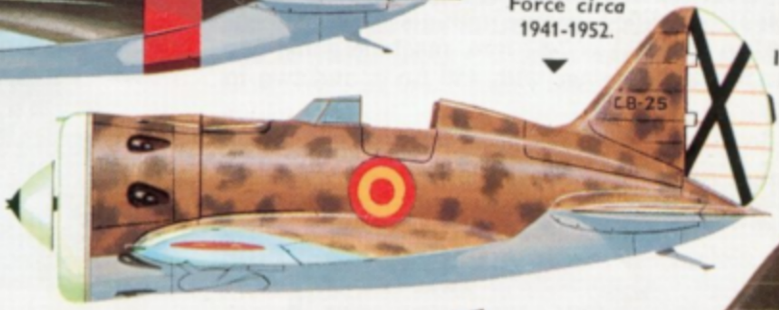


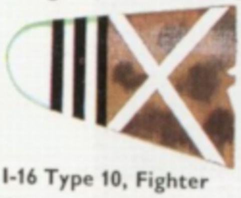
China.

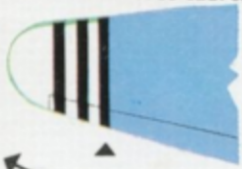
I-16 Type 10, Fighter Group 31, Spanish Republican Air Force, 1938. Fin emblem of "Popeye the Sailor-man" probably indicates use by sub-unit of International Brigade, rather than by Soviet Air Force cadre. ▶



I-16 Type 10, serial C.8-25, Moron Fighter School, Spanish Air Force *circa* 1941-1952. ▼

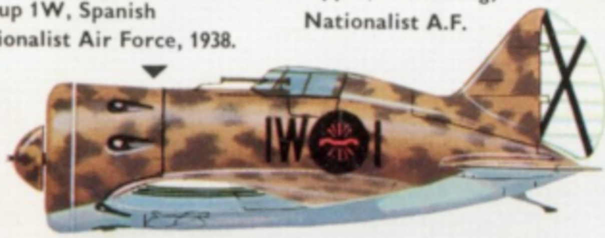




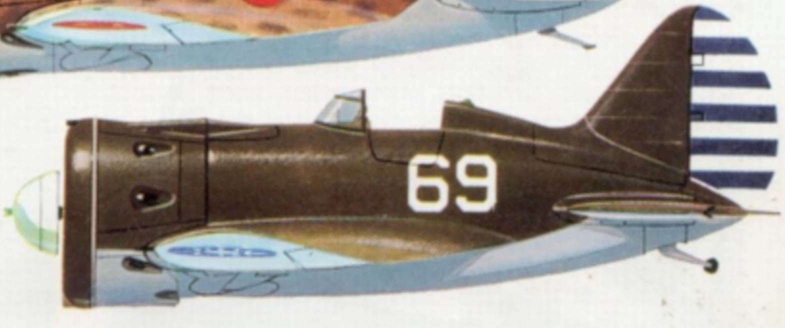


▲ Upper/under wing, Nationalist A.F.

I-16 Type 10, Fighter Group 1W, Spanish Nationalist Air Force, 1938. ▼



I-16 Type 10, Chinese Air Force, 1938. ▼



SPB (for *Skorostnyi Pikiruyushchii Bombardirovshchik*, Fast Dive Bomber); it was built essentially as a Type 24, with the armament reduced to two Shkas 12·7 mm. machine guns, plus two 250 kg. (551·2 lb.) bombs mounted underwing. By adopting the technique of approaching to within short range of the target "in harness", then dropping free and making pin-point attacks before making their way back to base under their own power, the SPB's were given an effective range of some 1,200 km. (app. 730 miles). Russian reports state that this combination was used operationally with great success; no confirmation is available from German sources.

MAJOR I-16 VARIANTS

CKB 12. Nine-cylinder air cooled radial M 22 engine of 450 h.p. (Licence-built Bristol Jupiter). Top speed, 360 km/h (224 m.p.h.); armament, two Shkas 7·62 mm. machine guns developed by Shpitalny and Komaritski.

I-16 Type 1. Up-rated M 22 of 480 h.p. Two Shkas 7·62 mm. machine guns. Loaded weight, 1,340 kg. (2,953 lb.). Wing loading, 100 kg./m^2 (20·48 lb./sq.ft.). Power loading, 3 kg./c.v. (6·7 lb./h.p.). Top speed, 360 km./h. (224 m.p.h.) at sea level, and 323 km./h. (200·6 m.p.h.) at 4,000 m. (13,123 ft.). Climb to 5,000 m. (16,404 ft.), 9 min. 24 secs.

I-16 Type 4 (CKB 12bis). M 25 air-cooled radial of 725 h.p. (Russian version of Wright Cyclone) driving all-metal two-blade airscrew. Loaded weight, 1,400 kg., (3,086 lb.). Wing loading, 112 kg./m^2 (22·8 lb./sq. ft.). Power loading, 2·2 kg./c.v. (4·6 lb./h.p.). Top speed, 398 km/h. (247·4 m.p.h.) at sea level, and 455 km./h. (282·7 m.p.h.) at 3,000 m. (9,842 ft.). Climb to 5,000 m. (16,404 ft.), 6 minutes. Service ceiling, 11,000 m. (36,089 ft.). Range, 820 km (509 miles).

I-16 Type 5. Similar to Type 4, but with loaded weight increased to approx. 1,450 kg. and 9 mm. armour plates added to pilot's seat.

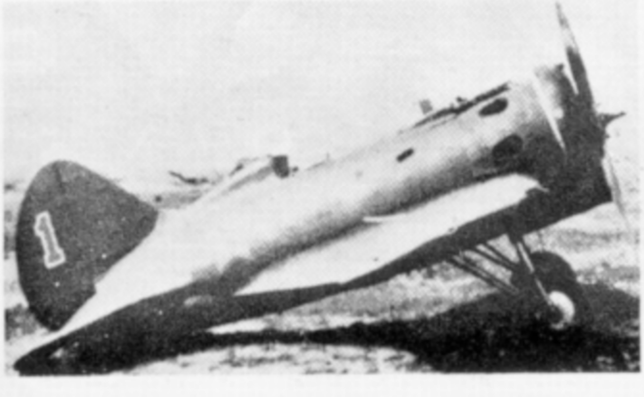
I-16 Type 6. M 25A engine up-rated to 730 h.p. at sea level. Armament remained at two Shkas 7·62 mm. machine guns, 750 r.p.g., rate of fire 1,500 r.p.m. Some minor structural changes. Empty weight, 1,300 kg. (2,866 lb.). Loaded weight, 1,600 kg. (3,527 lb.). Power loading, 2·4 kg./c.v. (5·2 lb./h.p.). Wing loading, 121 kg./m^2 (26·6 lb./sq. ft.). Climb to 5,000 m. (16,404 ft.), 6 mins. 18 secs. Some of the I-16's delivered to Spain were powered with the "master" Wright F.54 Cyclone engines of 775 h.p.

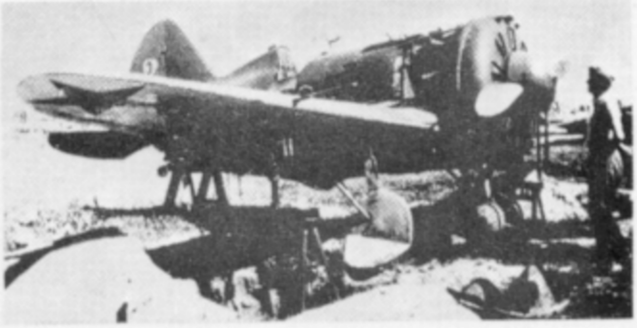
I-16 Type 10. M 25B engine of 750 h.p. at 3,000 m. (9,842 ft.); modified engine mounts. Armament increased to four Shkas 7·62 mm. machine guns, two in upper forward fuselage with 450 r.p.g. and two in wings with 750 r.p.g. Top speed, 464 km./h. (288·2 m.p.h.) at 3,000 m. (9,842 ft.). Climb to 5,000 m. (16,404 ft.), 6 mins. 30 secs. First series built entirely with open cockpit.

I-16P (CKB 12P). I-16 Type 10 airframe with two Shvak 20 mm. cannons mounted in fuselage machine gun bays. Not used operationally.

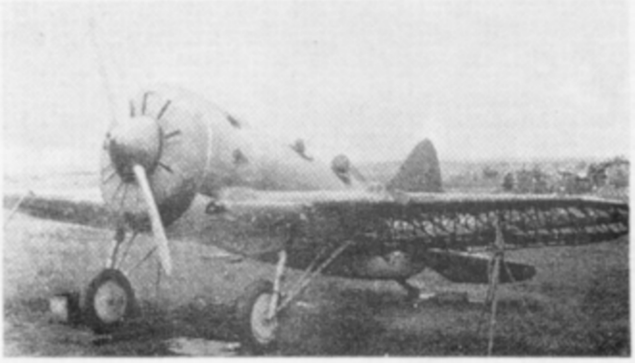
I-16 Type 17. Armed with two 7·62 mm. Shkas machine guns in fuselage, and two 20 mm. ShVak cannon in wing bays. Loaded weight, 1,790 kg. (3,945 lb.).

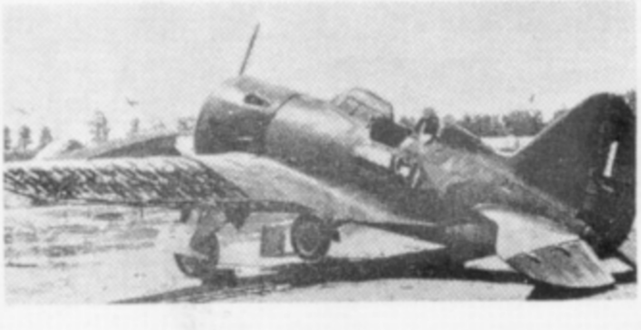
A late-model I-16, probably a Type 18; note the coloured fin and rudder, the braced, fixed undercarriage and the absence of the spinner. (Photo: Heinz Nowarra)

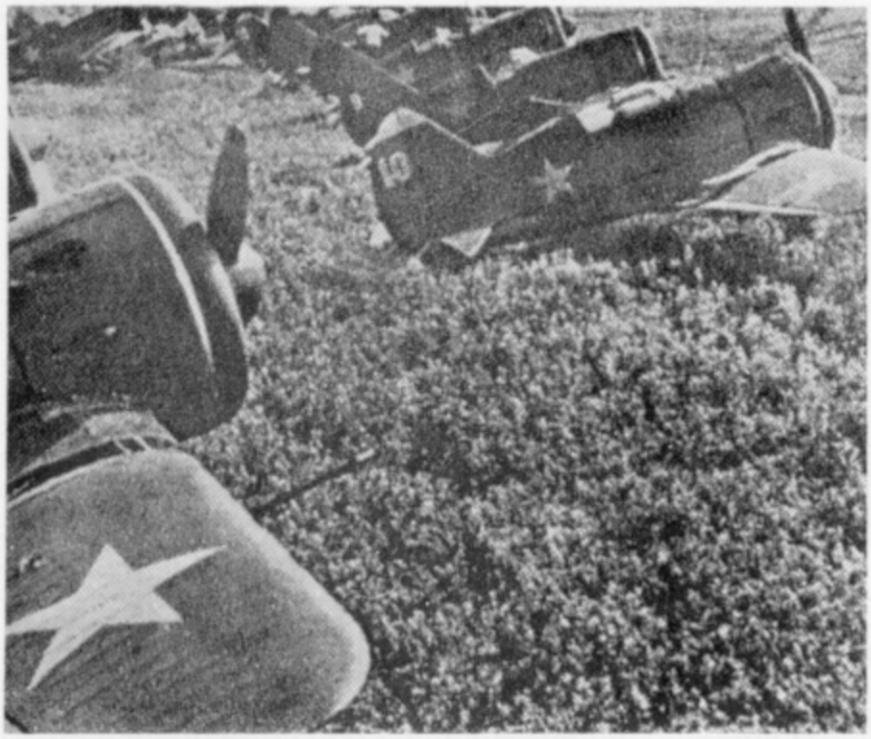




During the first months of fighting on the Russian Front, the I-16 was called upon to bear a great proportion of Soviet air defence. Still a useful anti-bomber aircraft, it was completely outclassed by the Bf 109E and F fighters which equipped the Luftwaffe's Jagdflieger *units. These photographs show I-16's shot down or damaged on the ground during the summer of 1941.* (Top) *a Type 24 displayed on an airstrip taken over by the* Luftwaffe; *note outboard position of underwing star.* (Above) *an I-16 destroyed near Stanislavov.* (Below) *an I-16UTI; note cowling details.* (Bottom) *an old Type 10; note early cockpit canopy.*
(Photos: Heinz Nowarra, the author, Heinz Nowarra, Zdenek Titz).







I-16's and I-15's, apparently captured on the ground or abandoned in the face of the German advance. Note battle damage to nearest aircraft; these are Type 10's.
(Photo: Zdenek Titz)

CKB 18. Experimental ground support machine. Armament consisted of four 7·62 mm. PV-1 machine guns, rate of fire 750 r.p.m., mounted in the fuselage to fire obliquely downwards; and two PV-1's in the wings. Underwing racks for two 50 kg. (110 lb.) bombs and considerable armour along the underside of the engine bay and cockpit were also provided.

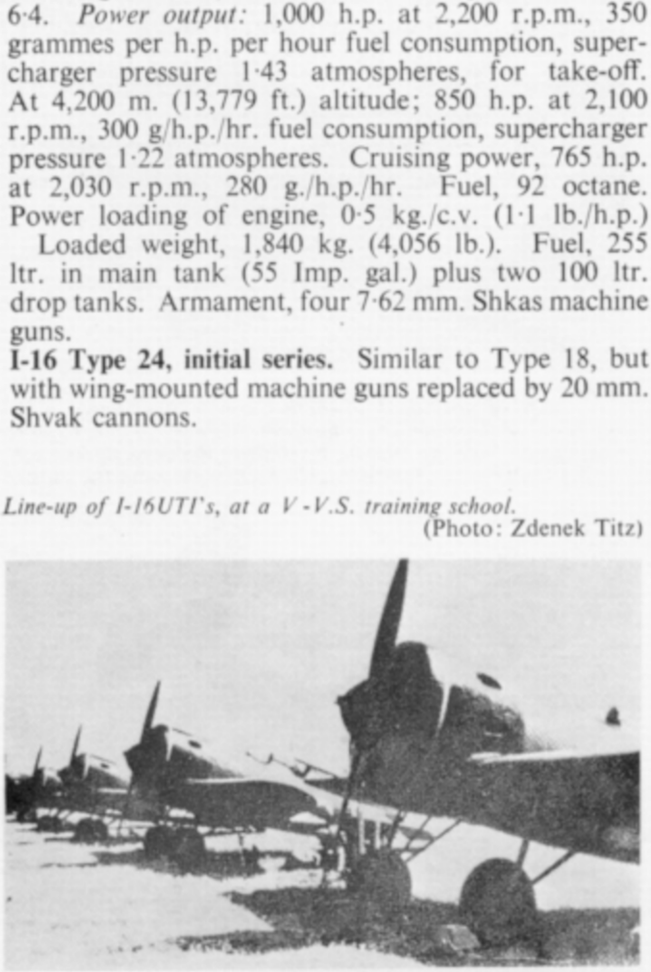
CKB 29. Similar to the I-16 Type 6 but with hydraulically operated flaps and undercarriage.

I-16 Type 18. Powered by M 62 nine-cylinder air-cooled radial engine with two-stage supercharger. Cylinder bore, 155·5 mm. Stroke, 174·5 mm. Working volume, 29·8 litres. Compression ratio, 6·4. *Power output:* 1,000 h.p. at 2,200 r.p.m., 350 grammes per h.p. per hour fuel consumption, supercharger pressure 1·43 atmospheres, for take-off. At 4,200 m. (13,779 ft.) altitude; 850 h.p. at 2,100 r.p.m., 300 g/h.p./hr. fuel consumption, supercharger pressure 1·22 atmospheres. Cruising power, 765 h.p. at 2,030 r.p.m., 280 g./h.p./hr. Fuel, 92 octane. Power loading of engine, 0·5 kg./c.v. (1·1 lb./h.p.)

Loaded weight, 1,840 kg. (4,056 lb.). Fuel, 255 ltr. in main tank (55 Imp. gal.) plus two 100 ltr. drop tanks. Armament, four 7·62 mm. Shkas machine guns.

I-16 Type 24, initial series. Similar to Type 18, but with wing-mounted machine guns replaced by 20 mm. Shvak cannons.

Line-up of I-16UTI's, at a V-V.S. training school.
(Photo: Zdenek Titz)



I-16 Type 24 B. See specification table at end of this *Profile.*

SPB. Type 24 without cannon armament, adapted for dive-bombing with two underwing 250 kg. (551·2 lb.) bombs. Top speed, 480 km./h. (298·2 m.p.h.). Loaded weight, 1,941 kg. (4,278·3 lb.).

I-180. Improved airframe with M 88 14-cylinder two-row air-cooled radial engine of 38·6 ltr. working volume, giving a take-off rating of 1,100 h.p. at 2,300 r.p.m., nominal power of 1,100 h.p. at 2,375 r.p.m. at 4,000 m. altitude (13,123 ft.). Cruise power, 990 h.p. at 2,200 r.p.m. at 4,000 m. altitude. Evolved in 1938, this type remained in the experimental stage; it is reported that a top speed of 550 km./h. (341·7 m.p.h.) was achieved during the flight test programme.

I-16 UTI (UTI-4). Two-seat fighter trainer, based on the Type 4 and Type 10 fighters. The UTI-4 was initially converted from standard Type 4 fighters during assembly; the I-16 UTI was a "scratch-built" two-seater based on the Type 10 airframe. The fuel tankage was reduced to accommodate a second cockpit. The early model had a down-locked undercarriage and was not armed; the I-16 UTI had a standard retractable undercarriage and retained two wing-mounted Shkas machine guns.

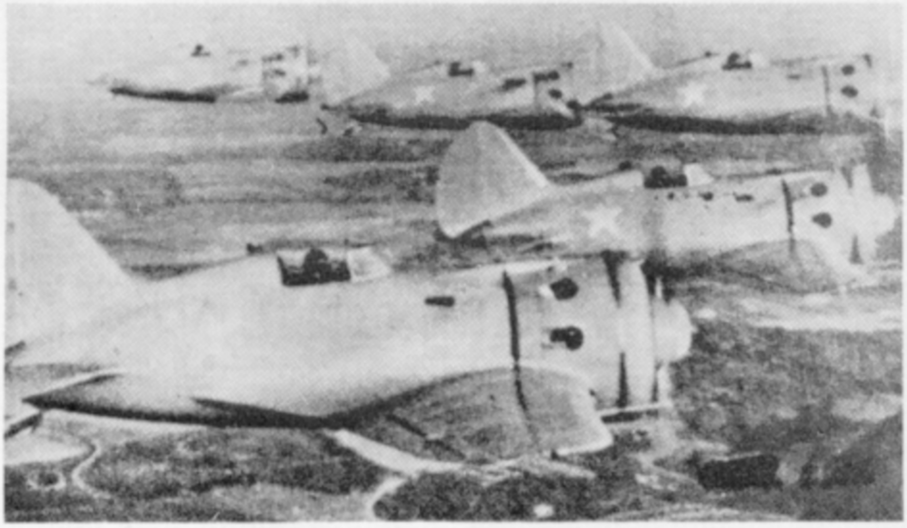
CKB 15(I-17). Produced in small numbers and reported to have seen limited combat service. Powered by an M 100 in-line liquid-cooled engine of 850 h.p. Top speed, 500 km./h. (310·6 m.p.h.). Armament comprised four shkas 7·62 mm. machine guns and one engine-mounted ShVak 20 mm. cannon, plus a bomb-load of 100 kg. (220 lb.).

THE I-16 IN SERVICE

The I-16 was produced in large numbers, probably between 18,000 and 20,000 machines. It was the standard Soviet single-seat fighter for a period of eight years, serving in front-line units from 1934 until late in 1942. It saw combat service in the Spanish Civil War, in the Russo-Finnish war, in the "Mongolian Incident", in the Sino-Japanese war, and on all fronts during the first year and a half of Soviet involvement in the Second World War.

Soviet Union

When the first deliveries of the Type 1 took place in 1934, the initial reaction of Soviet pilots was one of interest and pride in their modern fighter, which showed great possibilities. However, the darker side of such a radical change in equipment soon became apparent. Pilots who had been accustomed to stable biplanes with low landing speeds and short runway capability began to experience great difficulty in mastering this new weapon. Most of the service airfields were too short to accommodate the *Ishak's* 300 m. (330 yard) take-off and 230 m. (250 yard) landing runs in safety. The distraction of having to wind the undercarriage crank while maintaining correct airspeeds and glide-angles proved disastrous in several cases; and in addition to these basic

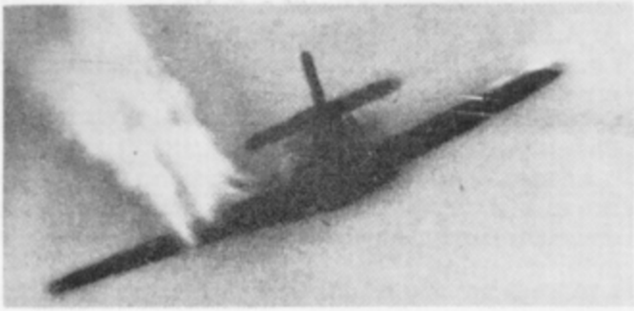


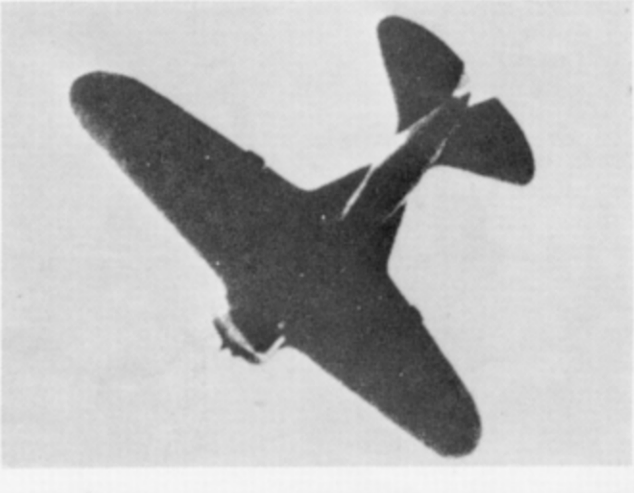
A rare formation photograph of I-16 Type 24's (Photo: via G. H. Kamphuis)

problems, the I-16 was very prone to stalling and was most unstable longitudinally. Crash-landings with the undercarriage retracted were a predictable result of absent-mindedness; and as the casualty figures mounted the pilots began to wait with the utmost apprehension for the day when they would have to fly this dangerous novelty. The designers combated this negative attitude in a way that was more effective than conclusive. In 1935 V.V.S. High Command assembled a picked group of pilots which included such aces as Chkalov, Suprun and Stefanovski; this unit was equipped with the I-16 and sent on a tour of all fighter bases. They gave individual and formation aerobatic displays and performed mock dog-fights; and at one of the Moscow Defence bases the three pilots named above carried out a team aerobatic display with their aircraft joined by ribbons from take-off to landing. This tour did much to overcome the resentment of the average service pilots, with its implied challenge to their skill. On the other hand, pilots of the calibre of these lengendary fliers could probably have given a safe-flying show mounted in any aeroplane in the world, however vicious its characteristics; but apparently not many of the watching Red Air Force men thought the situation out to that conclusion. With the growing availability of trainers, and the lengthening of certain key runways, the attitude of the service pilots returned to normal. As is often the case, the "killer" aircraft was accepted without demur once the pilots had been trained and familiarised with its more radical innovations.

Spain

The first unit to fly the *Ishak* into combat was Gen. Kamanin's group, directed to Spain in 1936 to support the operations of the Republican Government against the Nationalist rebels. By September of 1936, some 200 pilots and nearly 2,000 other personnel were in Spain together with about 105 I-16 Type 6 fighters, and a number of I-15 biplanes. These were shipped to Cartagena on Russian freighters and assembled on arrival. Based near Santander in Asturia, the I-16 units went into combat for the first time on November 5th. The Russian pilots and crews served for six months at a time, returning home to Russia at the end of one tour, to provide the greatest number with the valuable operational experience. In March 1937 all I-16 units were gathered under the administrative designation Fighter Group 31, consisting of seven squadrons of fifteen aircraft each. After this period an unknown number of these subunits were manned by foreign volunteers serving with the *Brigadas Internacionales*. The nick-name given to the I-16 by its opponents in Spain, *Rata*, the Rat, is probably the best-known of all its many titles. The I-16 soon gained mastery over the German He51 which at that time equipped the fighter units of the *Legion Condor;* and despite its lesser manoeuvrability, was able to break off combat at will with the CR.32's of the Italian Aviation Legion, by virtue of its greater speed in level flight and climb. The classic type of whirling dogfight was not the best stage for the *Rata* to demonstrate on, and quick kills from a zoom climb were soon found to be the right technique. When the Type 10 reached Spain in late 1937 it was opposed by the Messerschmitt Bf 109B's of *Jagdgruppe 88*, the *Legion Condor's* fighter force. There was little to choose between the two aircraft in speed, and the Messerschmitt's slightly superior turn radius was largely cancelled out by the I-16's better armament and climbrate. During the Civil War the Russian Government awarded a licence-production contract to Spain for the construction of Type 6 and Type 10 fighters. These were to be built at Alicante, where repair plants for the Russian machines had already been set up. In the event, only about 20 fighters and ten trainers were produced. After the end of hostilities, the 18 survivors of the 475 I-16's delivered were amalgamated with 15 built at Jerez from components captured at Alicante, and formed the Sevilla Regiment of the Spanish Air Army. (The Nationalists had already operated the I-16 with their Fighter Group 1W, equipped with captured machines). With spares captured during the Republican collapse the Sevilla Regiment





Necessarily of poor quality, these German gun-camera photographs show the rear and plan-form contours of the Ishak *to good effect. Note the trim tabs, visible in the undersurface view.*
(Photos: Passingham/Klepacki Collection, and the author)

Another view of the I-16UTI; note cockpit positions.
(Photo: via Zdenek Titz)

was able to maintain its serviceability at Tablada until 1943. When the Spanish fighter units received Messerschmitt Bf 109's, the *Ratas* were relegated to the advanced training rôle, under the Spanish designation C8. The last aircraft, C8-25, was struck off charge of the fighter school at Moron as late as June 1952.

Some sources maintain that Bruno Mussolini, son of the Italian dictator, was involved in a rather colourful combat with an I-16. It is said that Mussolini commanded an Italian fighter unit at Palma (Majorca) in August 1938; and that soon after receiving the new Fiat G.50 monoplane fighter, small numbers of which were used in Spain, he issued a challenge by radio for any five Government pilots to meet him in combat. A Republican unit known as the *Alas Rojos* (Red Wings) squadron was at that time based at Castellon de la Plana, equipped with I-16's and commanded by a Canadian volunteer pilot, Capt. Derek Dickinson. Dickinson was told of the Italian pilot's contemptuous gesture, received permission to answer the challenge, and passed his acceptance by radio to the Nationalist base. The two pilots met in the air at 12.00 hours on 18th September 1938, and the ensuing dog-fight lasted a little over 22 minutes. Both pilots were slightly wounded; and eventually Mussolini made a signal acknowledging defeat by throwing an article of flying clothing from the cockpit. No less than 326 bullet holes were counted in Dickinson's aircraft when he landed; but his victory in this action with an aircraft powered by an engine of 100 h.p. greater power is a tribute both to his flying ability and his aircraft.

China

Following the signing of a mutual assistance pact between the U.S.S.R. and China in 1937, four volunteer fighter units with about 50 I-16's were sent to China to help in the defence of that country against Japanese aggression. In addition, some 150 Type 6 and UTI-4 machines were supplied to the Chinese Air Force. They were operated with reasonable success against the Japanese A5M's and G2M's.

Mongolia

In July 1938, fighting broke out between the U.S.S.R. and Japan along the ill-defined border between Russian Mongolia and Manchuria. A truce was reached after about a month of operations, but fighting flared up again in May 1939 and continued for four months. Large numbers of aircraft were committed to combat by both sides; and the first I-16-equipped unit to reach the Nomon-Khan/Khalkin Gol area was a squadron (commanded by A. V. Vorosheykin, now a V.-V.S. General) of Major Nikolai Glazukin's 22nd Fighter Regiment. They were supplemented by the I-15bis fighters of the 70th Regiment. In all, 376 Russian fighters were committed to this theatre, against an estimated 252 Japanese; the main equipment of the latter force being the Kawasaki Ki-10, the Nakajima Ki-27 and some Mitsubishi A5M's.

On 5th August 1939, the 22nd Fighter Regiment was reinforced by a group of five I-16 Type 10 fighters, each with underwing rails for eight RS 82 rockets of 82 mm. calibre. This group was commanded by Captain Zvonariev, the other pilots being Pimienov, Fiedosov, Mikhaylenko, and Tkachenko; two technical officers, Popovich and Gubin, were also attached to the unit. On August 20th, at 16.57 hours, the 22nd Regt. and the rocket team took off together; and two A5M's were destroyed by air-to-air rocket fire. The following day, in two sorties, Zvonariev's group destroyed two bombers and three fighters. After fighting ended in Mongolia, the total of the rocket team's missions and claims proved to be impressive: in 85 combat missions totalling 68 hours 10 minutes, the group took part in 43 patrols, one reconnaissance, 27 miscellaneous sorties, and 14 major actions. Thirteen victories were claimed, composed of ten monoplane fighters and three bombers.

One I-16 was captured by the Japanese when a Mongolian pilot landed his machine at Arautaukou in Eastern Manchuria. Evaluated at Tachikawa in early 1940 by a team headed by Major G. Yamamoto, a leading J.A.A.F. pilot, the aircraft was considered insensitive and heavy on the controls, though the armament and ruggedness were praised. Strangely enough, when several more I-16 Type 10's and UTI's were captured in China in 1941, the reports passed to J.A.A.F headquarters were much more favourable; even the landing qualities were not considered unacceptable.

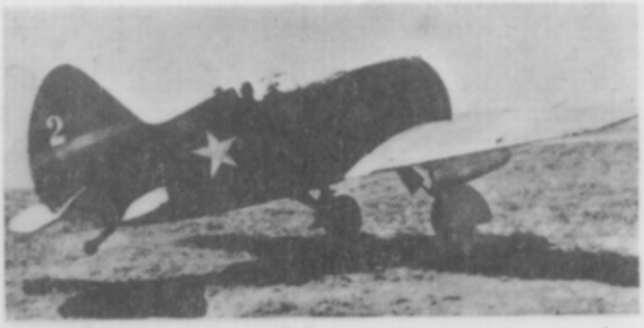
Finland

The *Ishak* was pitted against the Fokker D.XXI's of the Finnish Air Force during the Winter War of 1939-40, and achieved quite good results in the hands of the more experienced pilots; though it was more weight of numbers than any other factor which compelled the Finns to capitulate in 1940. When hostilities began again in 1941, the I-16 met the mixed equipment then operated by the Finns, including numbers of Brewster Buffaloes. Results of these actions largley depended on the skill of the pilots involved; by 1941 the I-16 was undeniably obsolescent. The aircraft was operated on ski undercarriages by both sides, several I-16's being captured during the Finnish advance of 1941. A small Finish unit operated the *Ishak*, the aircraft being given the serial numbers VH-200 *et seq*.

The Second World War

Despite the obvious advantages of the German Messerschmitt Bf 109E and Bf 109F fighters which opposed the I-16 in 1941, some remarkable results were achieved in the first desperate retreat by Soviet forces. The isolated successes were perhaps more the fruit of the fighting spirit of the crews than any real testimony to their aircraft; but the *Ishak* was a rugged little fighter, and did to the the best of its ability the job which it was allotted through the scarcity of the more modern MiG and LaGG fighters. Against unescorted bombers, the I-16 was still capable of doing considerable damage; and the 1st Fighter Regt., V.-V.S. was awarded the title "Guards Regiment" for its efforts against the *Luftwaffe* while equipped with

A factory-fresh Type 24. (Photo: Passingham/Klepacki Collection)



Late-model Ishak *taking off from a grass airstrip; note drop tank under starboard wing.* (Photo: via R. Ward)

the I-16. The "Little Donkeys" were particularly active during the defence of Moscow; on the evening of the 7th August 1941, a pilot named Viktor Talalikhin carried out the first night ramming attack in his I-16; he was later awarded the Gold Star of a Hero of the Soviet Union. His victim on that occasion was a Heinkel He 111, which crashed in a Moscow suburb. All the Russian aces of the early war years flew the I-16 until, with the growing numbers of more modern types available, it was relegated to ground-attack, town defence and second line duties far behind the Front. The famous Hero of the Soviet Union Alexiey Meresyev lost both his legs when shot down in an I-16; he later flew La 5 and La 7 fighters up to the end of the war. Another holder of the Gold Star, Zakhar Sorokin, flew I-16's in the Northern Zone, shooting down five German fighters during his patrols over the Barents Sea. In the Arctic, Captain Khlobystov flew the *Ishak* in defence of Murmansk. He later became famous for making three ramming attacks in one sortie, when equipped with a Lease-Lend Curtiss P-40. Arctic-based units often flew convoy patrols in the I-16; and several special units were detached to defend large industrial centres such as Leningrad, Moscow, and Kiev. The I-16 Type 24B's of these units occasionally sported patriotic slogans such as "For Leningrad", "For the Motherland", "Victory will be ours", "For Stalin", "We will never leave Leningrad", "For the U.S.S.R." etc. During heavy fighting round Kiev in August 1941, Lieutenant L. I. Borisov distinguished himself while flying an I-16 against a formation of Junkers Ju 88's. He made two firing passes at one bomber without decisive effect; he then rammed it, presumably attempting to cut into the tail control surfaces with his steel-shod propeller. Still the bomber flew on, and Bosisov eventually brought it down with his *second* ramming attack. Records indicate that he himself landed safely.

The SPB is known to have been used during the same month by a unit of the Naval Air Arm based on the Black Sea. Two TB-3's, each with two SPB's slung under the wings, attacked the Chernovidsk Bridge at night; the unit commander, Captain A. Shubikov, reports that a 150 yard span of the bridge was destroyed by the dive-bombers, including an important kerosene pipeline associated with it, and that a cargo vessel nearby was also sunk. All aircraft returned safely.

In 1942 newer machines began to be available to the V.-V.S. second-line units, and the *Ishak* was relegated to training school use. It was ideal as an advanced trainer, many Russian pilots claiming that if one could fly the I-16, one could handle Yaks and Lavochkins without any diffculty at all. The type was finally withdrawn from service late in 1943, after the victory at Stalingrad.

Already well past the peak of its service life when its greatest test came, Polikarpov's "Little Donkey" will always be remembered as a faithful "stop-gap" which stemmed the tide of the Nazi advance until the deliveries of LaGG 3's and MiG 3's reached realistic proportions; in this sense, the I-16 could be regarded as the Soviet counterpart of the Gloster Gladiator or the early Curtiss P-40 variants. In fact, it represented a more advanced concept than the Gladiator in several fundamental fields; and as the first low-wing monoplane fighter with enclosed cockpit and fully retractable undercarriage to reach widespread squadron service anywhere in the world, it is noteworthy from a historical as well as a nostalgic view-point.

STRUCTURE AND SPECIFICATION

Polikarpov I-16 Type 24B

Low-wing cantilever monoplane with radial engine. Fuselage of wooden monocoque construction, of glued cross-brased birch strips. Open cockpit with stiffened windshield. (Prior to Type 10, flat-topped perspex canopy and windshield built in one piece, the whole sliding forward in runners.) Wings of all-metal construction, built on two chrome steel spars with duralumin ribs and leading edge and duralumin skinning. (Prior to Type 18, wings of two-spar wooden construction, fabric-skinned.) The wings were built in three sections, centre-section integral with fuselage and outer sections with aelerons. Tail unit of metal construction, fabric-skinned. All control surfaces unbalanced. Main undercarriage legs, with oleo-pneumatic shock absorbers and wheel brakes, retractable by hand crank and cable. Retractable ski undercarriage often fitted, but seldom retracted in service. Fixed tail wheel or tail-skid. Armament mounted in wings immediately outboard of undercarriage, and in upper fuselage decking, firing through engine cowling and airscrew disc. Main fuel tank in forward fuselage aft of engine firewall. Provision for two under-wing drop tanks.

Dimensions: Length, 20 ft. ¾ in. Span, 29 ft. 6¼ in. Height, 8 ft. 5 in. Wing area, 161·45 sq. ft. Wing loading, 28·05 lb./sq. ft.

Weights: Empty 3,285 lb. Loaded, 4,215 lb. Overload, max. 4,550 lb.

Powerplant: Shvetsov 9-cylinder air-cooled radial engine type M63, with two-speed supercharger. Cylinder bore, 155·5 mm. Stroke, 174·5 mm. Working volume, 29·8 litre. Compression ratio 7·2.

Power output: Take-off, 1,100 h.p. at 2,300 r.p.m. at 1·45 atmospheres pressure. At 5,905 ft., 1,000 h.p. At 13,770 ft., 860 h.p. At 14,763 ft., 900 h.p. at 2,200 r.p.m. at 1·24 atmos. press., with fuel consumption of 315 grammes/h.p./hour. Power loading of engine, 1·05 lb./h.p.

Fuel capacity: 55·9 Imp. gal. in main fuselage tank, plus two 22 Imp. gal. drop tanks. Fuel octane, 94.

Armament: Two 7·62 mm. Shkas machine-guns in upper forward fuselage with 450 r.p.g. and two 20 mm. ShVak cannons in wings with 90 r.p.g., plus up to six 82 mm. RS-82 rockets on underwing rails.

Performance: Max. speed, 323 mp.h. at sea level, 288 m.p.h. at 13,779 ft. Cruising speed, 185 m.p.h. Range, with drop tanks, 435 miles at 185 m.p.h. Range, on main fuel tank, 248 miles at 185 m.p.h. Ceiling, 29,530 ft. Climb to 16,400 ft., 4 mins. 48 secs. Initial climb rate, 115 ft./sec.

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